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**PROJECT REPORT
COMMITTEE ON FOOD RESEARCH**

QUARTERMASTER FOOD AND CONTAINER INSTITUTE
FOR THE ARMED FORCES
CHICAGO ILLINOIS

RESEARCH AND DEVELOPMENT BRANCH
MILITARY PLANNING DIVISION
OFFICE OF THE
QUARTERMASTER GENERAL

COOPERATING INSTITUTION Rutgers University		LOCALITY New Brunswick, New Jersey
DIVISION College of Arts & Sciences		DEPARTMENT Bureau of Biological Research
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The Utilization of Proteins and Amino Acids

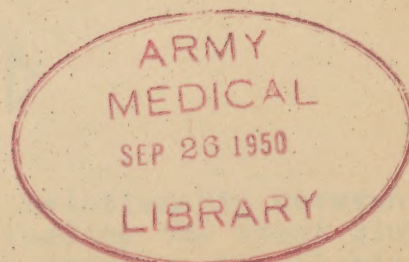
SUMMARY

Growth Experiments in Dogs

Six twelve-week old beagle puppies were put on the Rutgers protein-free diet to which 25% wheat gluten had been added. These puppies came from two litters, four from one and two from a second litter.

The daily caloric intake per kilogram of body weight over a period of seventy days are plotted in Figure 1. The caloric intakes gradually decreased from an initial value of approximately 225 calories/day/kg. to around 125 calories/day/kg. at the end of 70 days of wheat gluten feeding. The dogs grew well during this period and appeared to be in good physical condition. A close examination of the dogs, however, demonstrated that they were soft and fat.

Three of the littermates were removed from the wheat gluten diet at the end of 40 days and placed on an equivalent amount of defatted whole egg nitrogen (Viobin). The caloric intake of the dogs fed whole egg protein immediately decreased below the intake of those on wheat gluten. The circles in Figure 1 illustrate the caloric intakes of these dogs.



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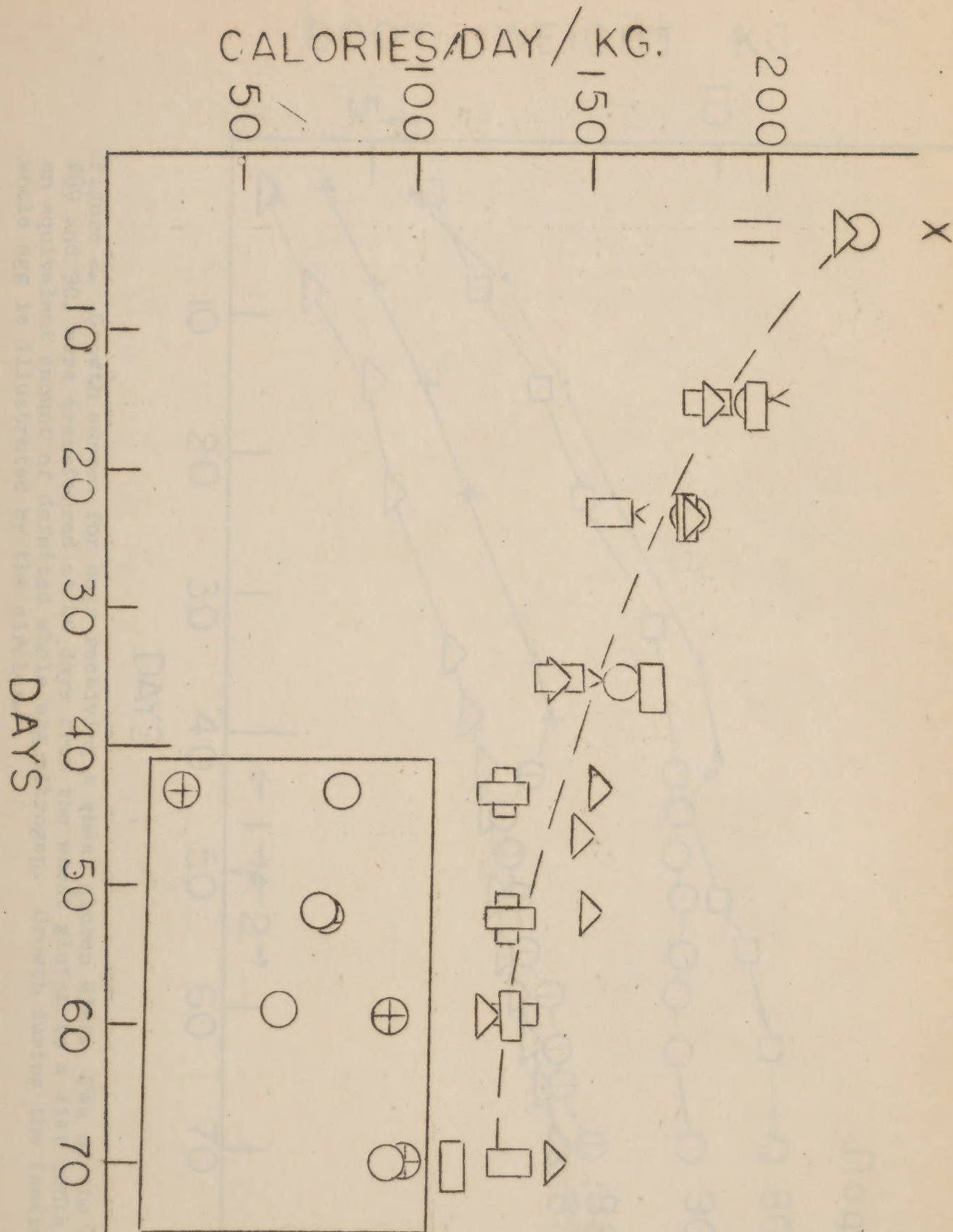


Figure 1. The broken line describes the relationship between calories/day/kilogram of body weight and days of feeding the wheat gluten diet (25%) to dogs. The circles represent the decrease in caloric intake which occurs when the dogs are transferred from wheat gluten to a diet containing an equivalent amount of defatted whole egg nitrogen (Viobin).

CALORIES/DAY / KG.

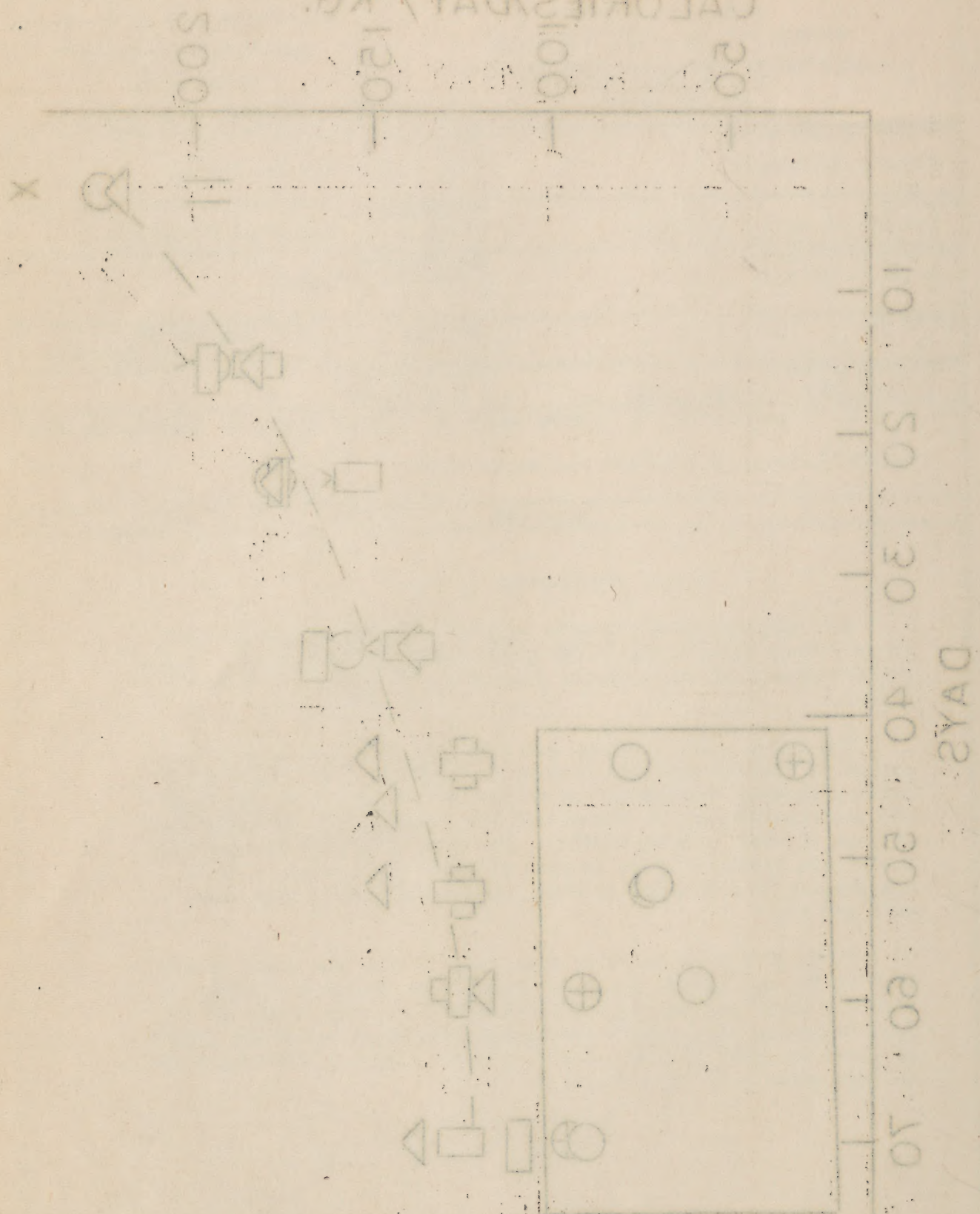


Figure 1. The broken line describes the relationship between calories/day/kg of body weight and days of feeding the wheat (15% diet) to dogs. The circles represent the decrease in calories intake (25%) occurs when the dogs are transferred from wheat (15% diet) containing an equivalent amount of delayed whole egg nitrogen (Vitamin).
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BODY WEIGHT KG.

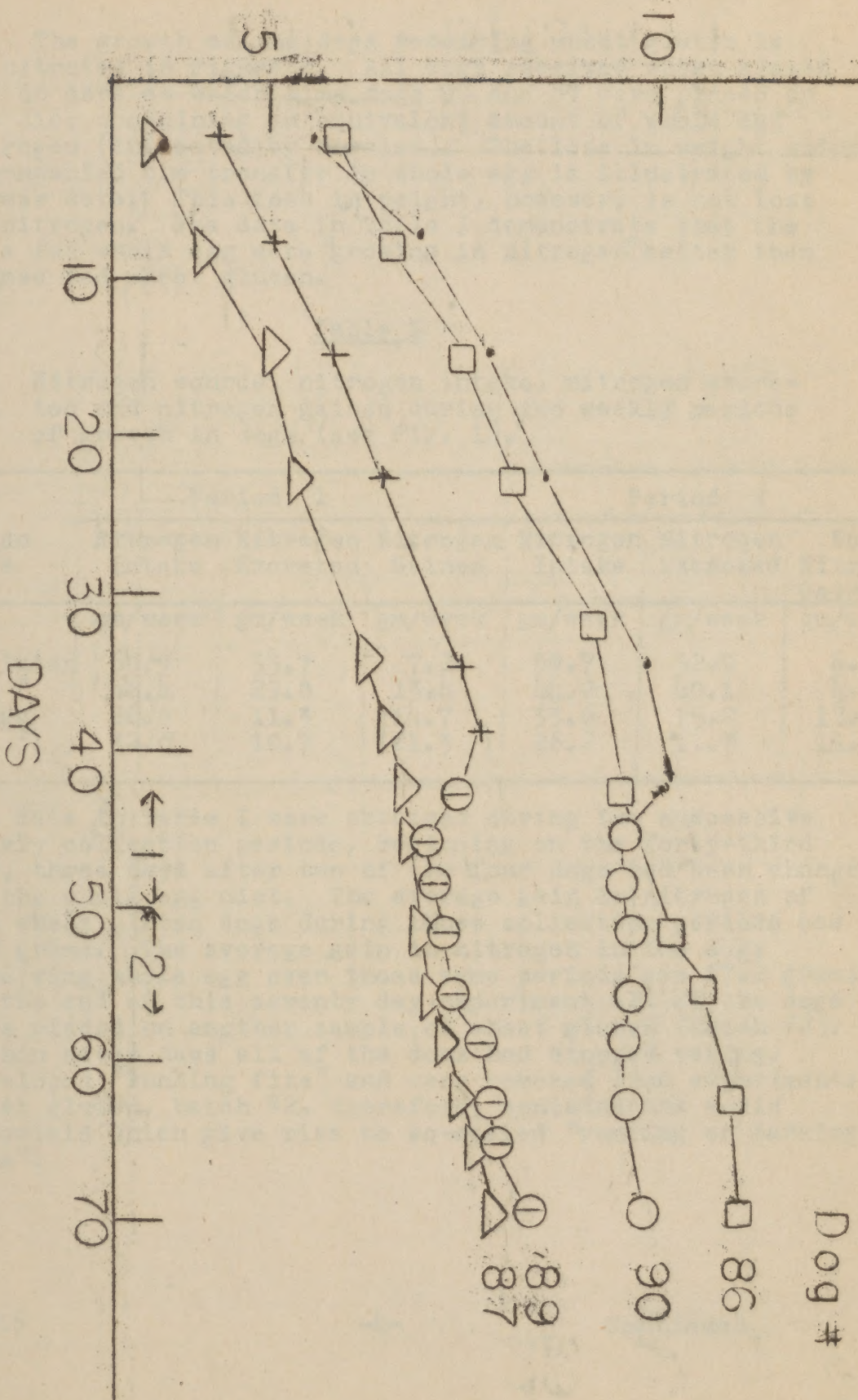
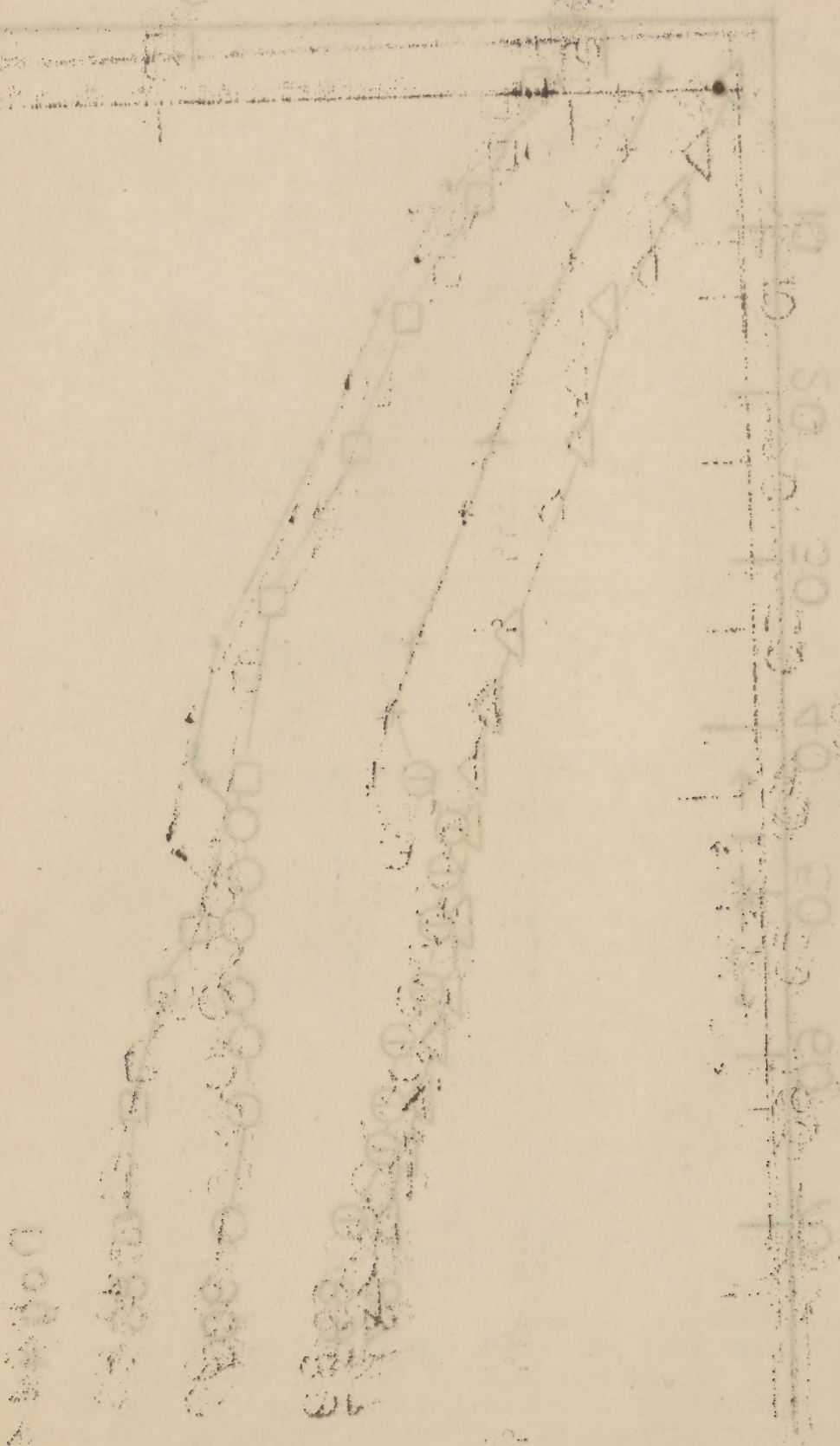


Figure 2. Growth curves for dogs receiving a wheat gluten diet. Two of the dogs, #89 and 90, were transferred at 40 days from the wheat gluten to a diet containing an equivalent amount of defatted whole egg nitrogen. Growth during the feeding of whole egg is illustrated by the circles.

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 are distributed over the surface of the body.

DATA



DATA

The growth of the dogs receiving wheat gluten is illustrated in Figure 2. All dogs received wheat gluten for 40 days at which time dogs 90 and 89 were placed on the diet containing an equivalent amount of whole egg nitrogen (indicated by circles). The loss in weight which accompanied the transfer to whole egg is illustrated by these data. This loss in weight, however, is not loss in nitrogen. The data in Table I demonstrate that the dogs fed whole egg were "growing in nitrogen" better than those fed wheat gluten.

Table I

Nitrogen source, nitrogen intake, nitrogen excreted and nitrogen gained during two weekly periods of growth in dogs (see Fig. 1).

Dog #	Nitrogen Source	Period 1			Period 2		
		Nitrogen Intake	Nitrogen Excreted	Nitrogen Gained	Nitrogen Intake	Nitrogen Excreted	Body Nitrogen Gained
		gm/week	gm/week	gm/week	gm/week	gm/week	gm/week
86	wheat gluten	60.9	53.7	7.2	59.7	52.9	6.8
87	"	42.4	29.0	13.4	44.2	40.1	4.1
89	whole egg	26.0	11.3	14.7	33.6	15.2	18.4
90	"	32.0	10.7	21.3	26.2	11.7	14.5

The data in Table I were obtained during two successive weekly collection periods, beginning on the forty-third day, three days after two of the four dogs had been changed to the whole egg diet. The average gain in nitrogen of the wheat gluten dogs during those collection periods was 7.9 grams. The average gain in nitrogen in the dogs receiving whole egg over those same periods was 17.2 grams. At the end of this seventy day experiment all of the dogs were placed on another sample of wheat gluten (Batch #2). Within seven days all of the dogs had stopped eating, developed "running fits" and were removed from experiment. Wheat gluten, batch #2, therefore, contains the toxic materials which give rise to so-called "running or barking fits".

The above information was obtained from a review of the files of the Department of the Interior, Bureau of Indian Affairs, and is being furnished to you for your information. It is requested that you keep this information confidential and not disseminate it to the public.

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The first of these is the fact that the
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In a second experiment a group of three littermates (cross between a beagle and bull terrier) were fed the whole egg diet. Two of this same litter and one beagle puppy of the same age as the others (12 weeks) were placed on the wheat gluten diet. The grams body weight gained per gram of nitrogen intake was measured over a three week period for each puppy. These values (P.E.), recorded in the third column of Table 2, are essentially the same whether the dogs were fed wheat gluten or whole egg.

Table II

Nitrogen source and P.E. (grams body weight gain per gram of nitrogen intake over a period of 21 days), the nitrogen intake, nitrogen excreted, body nitrogen gained over last two of the three weeks of feeding and the body nitrogen gained per gram of nitrogen intake.

Dog #	Nitrogen Source	P. E.	Nitrogen Intake NI	Nitrogen Excreted	Body Nitrogen Gained BNG	BNG NI
			gm/week	gm/week	gm/week	
91	wheat gluten	9.6	62.8	51.1	11.7	0.18
93	" "	8.0	61.3	47.8	13.5	0.22
94	" "	8.6	50.2	43.6	6.6	0.13
95	whole egg	10.6	66.9	31.8	35.1	0.52
96	" "	8.3	45.3	22.4	22.9	0.50
97	" "	8.0	48.1	25.1	23.0	0.48

The nitrogen intake, nitrogen excreted, and nitrogen gained the last two weeks of the experiment are also listed in Table 2. These data demonstrate that the body nitrogen gained per gram of nitrogen intake is much greater for whole egg than for wheat gluten. They emphasize the error that may be encountered in using growth curves to evaluate proteins in dogs.

In a second experiment a group of three littermates (one male and two females) were fed the whole egg diet. Two of these animals (15 weeks) were puppy of the same age as the others. The three body weights listed on the wheat diet. The three body weights gained per gram of nitrogen intake were recorded over a three week period for each puppy. These values are recorded in the third column of Table I, and are identical to the same whether the dogs were fed wheat gluten or whole egg.

Table II

Nitrogen balance and P.D. (grams body weight gain per gram of nitrogen intake over a period of 21 days) for the nitrogen intake, nitrogen excreted, body nitrogen gained over a period of the three weeks of feeding and the body nitrogen gained per gram of nitrogen intake.

Dog	Nitrogen Intake	Nitrogen Excreted	Nitrogen Gained	P.D.
	gm/week	gm/week	gm/week	
91	1.5	1.1	0.4	0.18
92	1.5	1.1	0.4	0.22
93	1.5	1.1	0.4	0.13
94	1.5	1.1	0.4	0.22
95	1.5	1.1	0.4	0.20
96	1.5	1.1	0.4	0.18

The nitrogen intake, nitrogen excreted, and nitrogen gained in the last two weeks of the experiment are also listed in Table I. These data demonstrate that the body nitrogen gained per gram of nitrogen intake is much greater for whole egg than for wheat gluten. They emphasize the fact that nitrogen excreted in urine growth curves to evaluate proteins in dogs.